

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

425-763PCT

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

MAR 29 2000

NEW 509571

INTERNATIONAL APPLICATION NO.

PCT/JP98/04366

INTERNATIONAL FILING DATE

29 September 1998

PRIORITY DATE CLAIMED

29 September 1997

## TITLE OF INVENTION

INFLATOR PROCESSING APPARATUS AND METHOD OF JUDGING CHARGE OF INFLATOR

## APPLICANT(S) FOR DO/EO/US

FUKABORI, Mitsuhiko; NAKABAYASHI, Nobuo; SAKAI, Kanshi; SUZUKI, Yasumitsu; YOSHITAKE,  
Norio; FUJIOKA, Masato

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19<sup>th</sup> month from the earliest claimed priority date
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(3)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(2)).
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98./International Search Report
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

1.) Three (3) Sheets of Formal Drawings

U.S. APPLICATION NO (if known, see 37 CFR 1.5) <b>9/509571</b>		INTERNATIONAL APPLICATION NO PCT/JP98/04366		ATTORNEY'S DOCKET NUMBER 425-763PCT	
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<p>17. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p><b>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5):</b>          Neither international preliminary examination fee (37 CFR 1.482)          nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO          and International Search Report not prepared by the EPO or JPO. .... <b>\$970.00</b></p> <p>International preliminary examination fee (37 CFR 1.482) not paid to          USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$840.00</b></p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO          but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. .... <b>\$690.00</b></p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO          but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$670.00</b></p> <p>International preliminary examination fee (37 CFR 1.482) paid to USPTO          and all claims satisfied provisions of PCT Article 33(1)-(4). .... <b>\$96.00</b></p> <p><b>- ENTER APPROPRIATE BASIC FEE AMOUNT =</b></p> <p>Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30          months from the earliest claimed priority date (37 CFR 1.492(e)).</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:15%;">CLAIMS</th> <th style="width:20%;">NUMBER FILED</th> <th style="width:20%;">NUMBER EXTRA</th> <th style="width:15%;">RATE</th> <th style="width:10%;"></th> <th style="width:10%;"></th> </tr> <tr> <td>Total Claims</td> <td>5 - 20 =</td> <td>-----</td> <td>X \$18.00</td> <td>\$</td> <td>-----</td> </tr> <tr> <td>Independent Claims</td> <td>2 - 3 =</td> <td>-----</td> <td>X \$78.00</td> <td>\$</td> <td>-----</td> </tr> <tr> <td colspan="3">MULTIPLE DEPENDENT CLAIM(S) (if applicable) Yes</td> <td>+ \$260.00</td> <td>\$</td> <td>260.00</td> </tr> <tr> <td colspan="4" style="text-align: right;"><b>TOTAL OF ABOVE CALCULATIONS =</b></td> <td>\$</td> <td>1230.00</td> </tr> <tr> <td colspan="4">Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).</td> <td>\$</td> <td>-----</td> </tr> <tr> <td colspan="4" style="text-align: right;"><b>SUBTOTAL =</b></td> <td>\$</td> <td>1230.00</td> </tr> <tr> <td colspan="4">Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).</td> <td>\$</td> <td>-----</td> </tr> <tr> <td colspan="4" style="text-align: right;"><b>TOTAL NATIONAL FEE =</b></td> <td>\$</td> <td>1230.00</td> </tr> <tr> <td colspan="4">Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +</td> <td>\$</td> <td>-----</td> </tr> <tr> <td colspan="4" style="text-align: right;"><b>TOTAL FEES ENCLOSED =</b></td> <td>\$</td> <td>1230.00</td> </tr> <tr> <td colspan="4"></td> <td style="text-align: right;">Amount to be: refunded</td> <td>\$</td> </tr> <tr> <td colspan="4"></td> <td style="text-align: right;">charged</td> <td>\$</td> </tr> </table>	CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			Total Claims	5 - 20 =	-----	X \$18.00	\$	-----	Independent Claims	2 - 3 =	-----	X \$78.00	\$	-----	MULTIPLE DEPENDENT CLAIM(S) (if applicable) Yes			+ \$260.00	\$	260.00	<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$	1230.00	Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$	-----	<b>SUBTOTAL =</b>				\$	1230.00	Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	-----	<b>TOTAL NATIONAL FEE =</b>				\$	1230.00	Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +				\$	-----	<b>TOTAL FEES ENCLOSED =</b>				\$	1230.00					Amount to be: refunded	\$					charged	\$	<p><b>CALCULATIONS PTO USE ONLY</b></p>	
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a. ☒ A check in the amount of \$ 1230.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account. No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
overpayment to Deposit Account No. 02-2448.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR  
1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:  
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SIGNATURE   
**STEWART, RAYMOND C.**  
 NAME

#21,066 (RCS)  
 REGISTRATION NUMBER

/RCS/sas March 29, 2000

09/509571

422 Rec'd PCT/PTO 29 MAR 2000

PATENT  
425-763P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: FUKABORI, Mitsuhiko et al  
Int'l. Appl. No.: PCT/JP98/04366  
Appl. No.: New Group: March 29, 2000  
Filed: March 29, 2000 Examiner: UNKNOWN  
For: INFLATOR PROCESSING APPARATUS AND  
METHOD OF JUDGING CHARGE OF  
INFLATOR

PRELIMINARY AMENDMENT

**BOX PATENT APPLICATION**

Assistant Commissioner for Patents  
Washington, DC 20231

March 29, 2000

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/JP98/04366 which has an International filing date of September 29, 1998, which designated the United States of America.--

004790-2560560


REMARKS

The specification has been amended to provide a cross-reference to the previously filed International Application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By   
Raymond C. Stewart, #21,066

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RCS/sas  
425-763P

(Rev. 01/08/2000)

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# Description

## INFLATOR PROCESSING APPARATUS AND METHOD OF JUDGING CHARGE OF INFLATOR

### Technical Field:

The present invention relates to an inflator processing apparatus adapted to process a gas generating chemical-containing inflator for an air bag of an automobile by heating the inflator to a temperature not lower than an operating temperature of the chemical and recover a metal case therefor, and to a method of judging the timing of charge of the inflator.

### Brief Description of the Drawings:

Fig. 1 is a longitudinal section illustrating one example of an inflator processing apparatus in accordance with this invention.

Fig. 2 is a flow chart illustrating a method of judging the timing of charge of inflators.

Fig. 3 is a longitudinal section illustrating an example of inflator processing by a conventional waste incinerator.

In the figures;

1: inflators;

2: processing furnace;

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- 3: incinerator;
- 4, 4a and 4b: furnace wall;
- 5: sealing valve;
- 6: charge pusher;
- 7: charger;
- 8a, 8b and 8c: partition wall;
- 9: processing gas supply port;
- 10: residue discharge port;
- 11: exhaust tube;
- 12: burner;
- 13: air supplier for dilution;
- 14: waste incinerator;
- 15: inflator charge port;
- 16: pressure sensor;
- 17: peak counter;
- 20: hopper.

#### Background of the Invention:

Installation of air bags has been already made compulsory by laws in U.S. and other countries as safety systems for mitigating impacts on human bodies in case of collisions of automobiles. In Japan, too, there is a high possibility that the installation is made compulsory by laws in the near future.

An inflator is an inflating device for such an air bag. A chemical contained in the inflator is operated by impact occurring at the time of a collision (for example,  $2\text{NaN}_3 + \text{CuO} \rightarrow \text{Na}_2\text{O} + \text{Cu} + 3\text{N}_2$ ), thereby generating an  $\text{N}_2$  gas by which the air bag is instantly inflated to protect a passenger(s).

Also, in Japan, new cars equipped with air bags have been recently increasing in number. Since, when those cars equipped with air bags are disposed, a large number of chemical-containing inflators will be generated, it is necessary to operate and process the chemical safely and recover a metal case of the inflator from the standpoints of safety and effective utilization of resources.

However, since, in recent years, those air bags have started to be installed in automobiles, established processing techniques are not available, and it is the present state that experiments are being conducted to search for a processing method, for example, using a conventional waste incinerator 14, as shown in Fig. 3. This waste incinerator 14 includes a furnace shell formed by a furnace wall 4, an inflator charge port 15 for charging inflators 1 into the incinerator 14, a burner 12 for heating and processing the charged inflators 1, a residue discharge port 10 for discharging the processed inflators 1, and an exhaust tube 11 for evacuating the interior of the incinerator.



problems, and its object is to provide an inflator processing apparatus adapted to prevent damage to a furnace wall refractory of an inflator and the melting of a metal case for the inflator during an operation of a chemical in the thermal processing of the inflator containing the gas generating chemical as well as to provide a method of judging the timing of charge of the inflator.

In order to solve the foregoing problems, the gist of this invention lies:

(1) An inflator processing apparatus adapted to process a gas generating chemical-containing inflator for an air bag of an automobile by heating the inflator to a temperature not lower than an operating temperature of the chemical and recover a metal case therefor, wherein a metal partition wall is provided between an inner surface of a wall of a processing furnace for processing the inflator and the inflator so as to cover the inner surface of the furnace wall;

(2) An incinerator provided with a burner and an air supplier for dilution and/or an exhaust gas circulator is connected with the processing furnace; and

(3) The timing of charge of the inflator is judged by comparing the number of charged inflators with the number of peak points of furnace pressure during an operation of the chemical.

[Function]

In the inflator processing apparatus and the method of judging charge of inflators in accordance with this invention, since the metal partition wall is provided between the inner surface of the wall of the processing furnace and the inflator so as to cover the inner surface of the furnace wall, the inflator or its fragments splashed by the operation of the chemical collide against the metal partition wall and drop on a floor of the furnace, so that the furnace wall refractory is not damaged.

Further, since a high-temperature flame is generated in the incinerator connected with the processing furnace of the inflator and mixed with an ordinary-temperature air for dilution or/and a low-temperature exhaust gas to obtain a processing gas temperature slightly higher than the operating temperature of the chemical, and uniform and soft heating of the inflator is carried out by this processing gas, not only the heating time necessary for the processing of the operation of the inflator becomes constant, but also the melting of the metal case of the inflator and high-temperature oxidation of the metal partition wall of the processing furnace due to the processing gas are prevented.

Additionally, since the timing of charge of the inflator is judged by comparing the number of charged inflators with the

number of peaks of furnace pressure during the operation of the chemical, during charge of the inflator, ejection of the gas generated in the furnace due to the operation of the inflator is prevented.

#### Form to Carry Out the Invention

An embodiment of the present invention is hereinafter described with reference to the drawings.

Fig. 1 is a longitudinal section of an inflator processing apparatus illustrating one embodiment of the invention and a conceptual diagram illustrating a method of judging the timing of charge of the inflator.

As shown in Fig. 1, the inflator processing apparatus is constituted by a processing furnace 2 for processing inflators 1 and an incinerator 3 connected together, and shells of the processing furnace 2 and of the incinerator 3 are formed by furnace walls 4a and 4b, respectively.

Since the furnace walls 4a and 4b are required to have refractoriness, heat insulation, and hermeticity, the outer shells of the furnace walls 4a and 4b are normally made of steel skin, and inner surfaces of the steel skin are lined with a refractory material such as castable ceramic fibers.

A charger 7 constituted by a sealing valve 5 and a charge pusher 6 is provided in a side portion of the wall 4a of the

processing furnace 2, and the inflators 1 are charged intermittently into the processing furnace 2 by the charger 7.

From the standpoint of preventing the ejection of the gas generated in the furnace, it is desired to operate the sealing valve 5 and the charge pusher 6 for a short period of time, and a driving apparatus to be used is generally in a pneumatic driving mode.

Metal partition walls 8a, 8b, and 8c are provided between the inner surface of the inflator 1 charged in the processing furnace 2 and the furnace wall 4a of the processing furnace 2. Since the metal partition walls 8a, 8b, and 8c are required to have heat resistance and heat strength, a heat-resisting steel such as SUS310S is usually used.

Further, a processing gas supply port 9 for heating the inflators and a residue discharge port 10 for the inflators 1 are provided in a lower portion of the processing furnace 2 as well as an exhaust tube 11 for the processing gas after heating the inflators is provided in an upper portion thereof.

On the other hand, a burner 12 is aligned in one terminal side of the incinerator 3, and a fuel and an air for combustion are supplied as well as an air for dilution is supplied into the incinerator 3 from an air supplier for dilution 13 provided in an outer portion of the burner 12.

The incinerator 3 and a furnace bottom portion of the

processing furnace 2 constructed in this way are connected through the processing gas supply port 9, and a processing gas for heating the inflators 1 is supplied into the processing furnace 2 from the incinerator 3.

Next, the operation and function of the inflator processing apparatus in accordance with this invention will be described, together with a method of judging the timing of charge of the inflators.

A fuel and an air for combustion are supplied into the burner 12 of the incinerator 3 to generate a high-temperature flame, and the temperature of this high-temperature flame is adjusted to a processing gas temperature adapted for the processing temperature of the inflators 1 and slightly higher than the operating temperature of the chemical by the air for dilution from the air supplier for dilution 13, and then blown into the furnace bottom portion of the processing furnace 2 from the processing gas supply port 9.

On the other hand, after opening the sealing valve 5 of the charger 7, the charge pusher 6 is operated to charge the inflators 1 into the processing furnace 2, and immediately thereafter, the sealing valve 5 is closed.

Since the inflators 1 charged in the processing furnace 2 are heated uniformly and softly by a low-temperature processing gas supplied through the processing gas supply port

9, the heating time of the inflators 1 is substantially uniform, and, as a result, the operating time of the chemical is rendered substantially uniform. Also, since the temperature of the processing gas is low, the melting of the metal case of the inflator 1 and high-temperature oxidation of the metal partition walls 8a, 8b, and 8c of the processing furnace 2 are prevented.

Further, since the metal partition walls 8a, 8b, and 8c are provided so as to cover the inner surface of the furnace wall 4a of the processing furnace 2, the inflators 1 and their fragments splashed by the operation of the chemical collide directly against the partition walls 8a, 8b, and 8c and drop on the furnace floor so that the furnace wall 4a is not damaged. Accordingly, a soft furnace material such as ceramic fibers having good heat responsibility can be used as the furnace wall 4a, and it is easy to start up the furnace.

The processing gas after the inflators 1 have been heated is discharged as a low-temperature exhaust gas out of the furnace through the exhaust tube 11.

On the other hand, the residues from the inflators 1 after the heating processing are periodically taken out of the furnace through the residue discharge port 10.

When a large number of inflators 1 are simultaneously charged into the processing furnace 2, the probability of

simultaneous operation of the chemical increases, and as a result, the maximum furnace pressure increases, whereby ejection of the gas generated in the furnace through the sealing portion of the furnace body occurs. Thus, for safety, it is necessary to intermittently charge a few of the inflators 1 into the processing furnace 2.

The timing of intermittent charge of the inflators 1 is determined by the method of judging the timing of charge of the inflators as illustrated in Fig. 2. That is, the number of operations of the chemical is counted with a pressure sensor 16 provided on the processing furnace 2 and with a peak counter 17 for a furnace pressure signal, and only in case where the number of counted peaks of the furnace pressure (i.e., the number of pressure peak points) coincides with the number of charged inflators 1, the next inflators 1 are charged.

As a result, since the chemical is not operated during charge of the inflators, the charging work is safe, and, in addition, an interval of charge of the inflators 1 is a minimum time, thereby maximizing the performance of the processing apparatus.

It is to be understood the present this invention is not limited to the embodiment described above and that, as a matter of course, various changes and modifications can be made therein without departing from the gist of this invention, for example,

as given below.

(1) The metal partition walls 8a and 8b of the processing furnace 2 are fabricated into a hermetic integral structure, and the furnace wall 4a made of a refractory such as ceramic fibers is formed directly on the outer portion thereof.

(2) For the adjustment of the temperature of the high-temperature combustion gas generated in the incinerator 3, the exhaust gas from the processing furnace 2 or an air preheated by recovering waste heat from the exhaust gas, thereby reducing the fuel consumption rate.

(3) The furnace bottom portion of the processing furnace 2 is fabricated into a refractory grid structure, and the processing gas is supplied from a lower portion of the refractory grid, thereby promoting heat transfer to the inflators 1.

(4) The inflators 1 are heated by an electric heater provided outside the metal partition walls 8a, 8b, and 8c.

(5) A sealing valve similar to the sealing valve 5 of the charger 7 for the inflators 1 is further provided, for example, inside the hopper 20 to form the double sealing valves, and the pusher 6 is provided between the double sealing valves, thereby preventing ejection of the gas in the furnace during charge of the inflators 1.

(6) The furnace bottom portion of the processing furnace

2 can be replaced with an elevatable furnace floor. The processing residues on the furnace floor, which is lowered down, are automatically discharged by the pusher. By pushing up the furnace floor against the main body of the processing furnace 2 by means of a hydraulic unit, etc., the sealing between them is secured.

(7) As measures for the exhaust gas and noise during an operation of the chemical, an exhaust gas processor such as a gas neutralizer or a dust arrester and a silencer (if necessary, an exhauster may be provided together) are provided in the downstream side of the exhaust tube 11.

#### Advantages of the Invention:

As described above, the inflator processing apparatus and the method of judging the timing of charge of inflators in accordance with the present invention give rise to the following advantages:

(1) Since the metal partition walls are provided between the inner surface of the furnace wall of the processing furnace and each inflator so as to cover the inner surface of the furnace wall, during an operation of the chemical, damage to the furnace wall refractories due to the inflators or their splashed fragments is prevented.

(2) Since the temperature of the high-temperature flame

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of the burner as a heating source of the inflators is adjusted by the ordinary-temperature air for dilution or/and the low-temperature exhaust gas, and the lower-temperature processing gas after the temperature adjustment is used for heating inflators softly and uniformly, the heating time up to an operation of the chemical is made uniform as well as the melting of the metal case of the inflator and the high-temperature oxidation of the metal partition walls of the processing furnace due to the processing gas are prevented.

(3) Since the timing of the intermittent charge of the inflators is determined by comparing the number of charged inflators with the number of peaks of the furnace pressure during an operation of the chemical, ejection of the processing gas out of the furnace due to the operation of the chemical is prevented during charge of the inflators. Therefore, not only the charging work is safe, but also the inflators can be subjected to heating and processing in a minimum time, thereby maximizing the performance of the processing apparatus.

## Claims

1. An inflator processing apparatus adapted to process a gas generating chemical-containing inflator for an air bag of an automobile by heating the inflator to a temperature not lower than an operating temperature of the chemical and recover a metal case therefor, wherein a metal partition wall is provided between an inner surface of a wall of a processing furnace for processing the inflator and the inflator so as to cover the inner surface of the furnace wall.
2. The inflator processing apparatus as claimed in Claim 1, wherein an incinerator provided with a burner and an air supplier for dilution or/and an exhaust gas circulator is connected with the processing furnace.
3. The inflator processing apparatus as claimed in Claim 1 or 2, wherein the timing of charge of the inflator is judged by comparing the number of charged inflators with the number of peak points of furnace pressure during an operation of the chemical.
4. A method of judging the timing of charge of inflators into an inflator processing apparatus adapted to process a gas generating chemical-containing inflator for an air bag of an automobile by heating the inflator to a temperature not lower than an operating temperature of the chemical, wherein the

timing of charge of the inflators is judged by comparing the number of charged inflators with the number of peak points of furnace pressure during an operation of the chemical.

## Abstract

To prevent damage to a furnace wall refractory and the melting of a metal case for an inflator during an operation of a chemical in the thermal processing of the inflator containing the gas generating chemical.

An inflator processing apparatus adapted to process a gas generating chemical-containing inflator for an air bag of an automobile by heating the inflator to a temperature not lower than an operating temperature of the chemical, and recover the metal case for the inflator, wherein a metal partition wall is provided between an inner surface of a wall of an inflator processing furnace and the inflator so as to cover the inner surface of the furnace wall.

Fig. 1

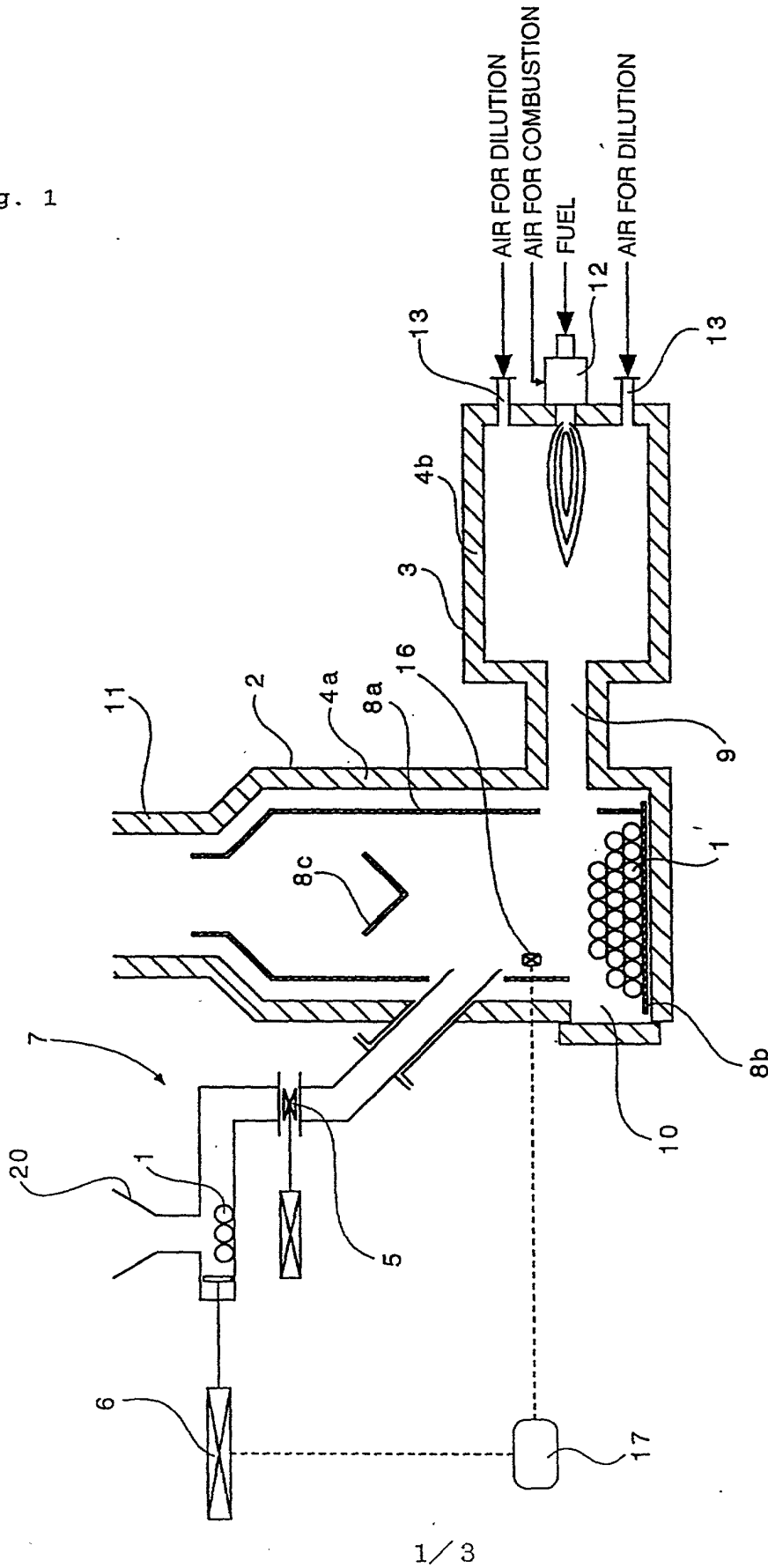


Fig. 2

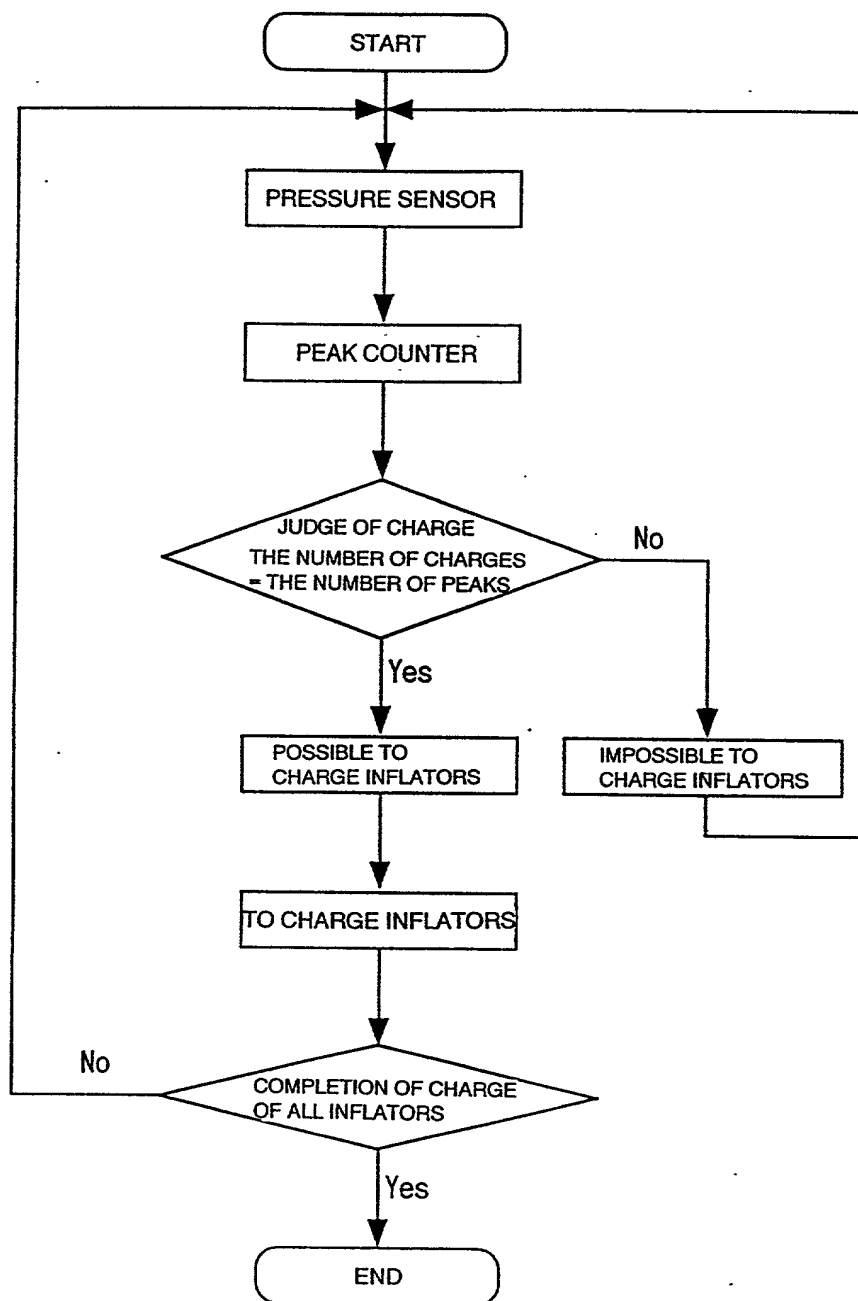
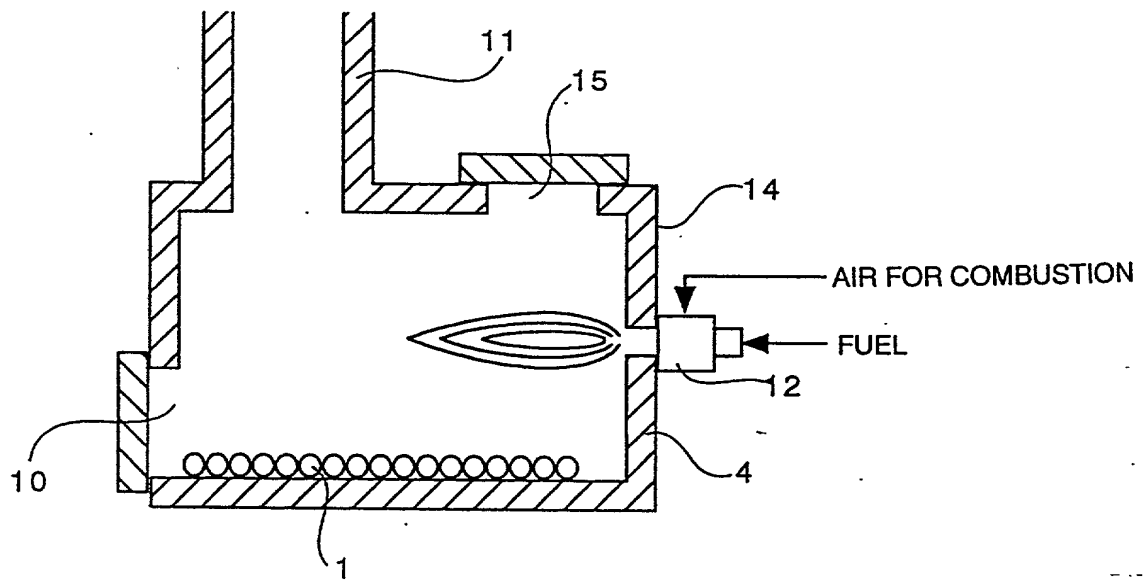


Fig. 3



**PLEASE NOTE:  
YOU MUST  
COMPLETE THE  
FOLLOWING**

# COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert Title: INFLATOR PROCESSING APPARATUS AND METHOD OF JUDGING CHARGE OF INFLATOR

Fill in Appropriate  
Information -  
For Use Without  
Specification  
Attached:

the specification of which is attached hereto. If not attached hereto,  
the specification was filed on \_\_\_\_\_ as  
United States Application Number \_\_\_\_\_;  
and amended on \_\_\_\_\_ (if applicable) and/or  
the specification was filed on September 29, 1997 as PCT  
International Application Number PCT/JP98/04366; and was  
amended under PCT Article 19 on \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Insert Priority  
Information:  
(if appropriate)

Prior Foreign Application(s)			Priority Claimed	
<u>9/264574</u> (Number)	<u>Japan</u> (Country)	<u>September 29, 1997</u> (Month/Day/Year Filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (Month/Day/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (Month/Day/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (Month/Day/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No

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Insert Provisional  
Application(s):  
(if any)

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

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17	Raymond C. Stewart	(Reg. No. 21,066)	Terrell C. Birch	(Reg. No. 19,382)
	Joseph A. Kolasch	(Reg. No. 22,463)	James M. Slattery	(Reg. No. 28,380)
	Bernard L. Sweeney	(Reg. No. 24,448)	Michael K. Mutter	(Reg. No. 29,680)
	Charles Gorenstein	(Reg. No. 29,271)	Gerald M. Murphy, Jr.	(Reg. No. 28,977)
	Leonard R. Svensson	(Reg. No. 30,330)	Terry L. Clark	(Reg. No. 32,644)
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	John W. Bailey	(Reg. No. 32,881)	John A. Castellano	(Reg. No. 35,094)
	Gary D. Yacura	(Reg. No. 35,416)		

Send Correspondence to:

**BIRCH, STEWART, KOLASCH & BIRCH, LLP** or **Customer No. 2292**  
P.O. Box 747 • Falls Church, Virginia 22040-0747  
 Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First  
or Sole Inventor:  
Insert Name of  
Inventor  
Insert Date This  
Document is  
Signed

Insert Residence  
Insert Citizenship  
Insert Post Office  
Address

Full Name of Second  
Inventor, if any:  
above

Full Name of Third  
Inventor, if any:  
above

Full Name of Fourth  
Inventor, if any:  
above

Full Name of Fifth  
Inventor, if any:  
above

GIVEN NAME/FAMILY NAME Mitsuhiko FUKABORI	INVENTOR'S SIGNATURE <i>Mitsuhiko Fukabori</i>	DATE* APR 18, 2000
Residence (City, State & Country) Hyogo, Japan <i>SPX</i>		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 90-38, Shinzaike, Ibogawa-cho, Ibo-gun, Hyogo, Japan		
GIVEN NAME/FAMILY NAME Nobuo NAKABAYASHI	INVENTOR'S SIGNATURE <i>Nobuo Nakabayashi</i>	DATE* APR 18, 2000
Residence (City, State & Country) Osaka, Japan <i>SPX</i>		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 153, Moriya, Chihaya-Akasakamura, Minamikawachi-gun, Osaka, Japan		
GIVEN NAME/FAMILY NAME Kanshi SAKAI	INVENTOR'S SIGNATURE <i>SPX</i>	DATE*
Residence (City, State & Country) Toyota-shi, Aichi, Japan <i>SPX</i>		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan		
GIVEN NAME/FAMILY NAME Yasumitsu SUZUKI	INVENTOR'S SIGNATURE <i>SPX</i>	DATE*
Residence (City, State & Country) Toyota-shi, Aichi, Japan <i>SPX</i>		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan		
GIVEN NAME/FAMILY NAME Norio YOSHITAKE	INVENTOR'S SIGNATURE <i>SPX</i>	DATE*
Residence (City, State & Country) Kitakyushu City, Fukuoka, Japan <i>SPX</i>		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Nippon Steel Corporation 46-59, Oaza-Nakabaru, Tobata-ku, Kitakyushu City, Fukuoka, Japan		

Full Name of Sixth  
Inventor, if any.  
above

GIVEN NAME/FAMILY NAME Masato FUJIOKA	INVENTOR'S SIGNATURE	DATE*
--	----------------------	-------

Residence (City, State & Country) Kitakyushu-shi, Fukuoka, Japan	CITIZENSHIP Japanese
---	-------------------------

POST OFFICE ADDRESS (Complete Street Address including City, State & Country)  
c/o Kyuchiku Kogyo KK, 9-10, Sanno 1-chome, Yahatahigashi-ku, Kitakyushu-shi, Fukuoka, Japan

Full Name of Seventh  
Inventor, if any.  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country)

Full Name of Eighth  
Inventor, if any.  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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Residence (City, State & Country)	CITIZENSHIP
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country)

Full Name of Ninth  
Inventor, if any.  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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Residence (City, State & Country)	CITIZENSHIP
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country)

Full Name of Tenth  
Inventor, if any.  
above

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Residence (City, State & Country)	CITIZENSHIP
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country)

Full Name of Eleventh  
Inventor, if any.  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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Residence (City, State & Country)	CITIZENSHIP
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country)

Full Name of Twelfth  
Inventor, if any.  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
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Residence (City, State & Country)	CITIZENSHIP
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country)

\*DATE OF SIGNATURE

**BIRCH, STEWART, KOLASCH & BIRCH, LLP**P.O. Box 747 • Falls Church, Virginia 22040-0747  
Telephone: (703) 205-8000 • Facsimile: (703) 205-8050**PLEASE NOTE:  
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Gary D. Yacura	(Reg. No. 35,416)		

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Full Name of First  
or Sole Inventor:  
Insert Name of  
Inventor  
Insert Date This  
Document is  
Signed

Insert Residence  
Insert Citizenship  
Insert Post Office  
Address

Full Name of Second  
Inventor, if any:  
above see

Full Name of Third  
Inventor, if any:  
above see

Full Name of Fourth  
Inventor, if any:  
above see

Full Name of Fifth  
Inventor, if any:  
above see

GIVEN NAME/FAMILY NAME Mitsuhiko FUKABORI	INVENTOR'S SIGNATURE	DATE*
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 153, Moriya, Chihaya-Akasakamura, Minamikawachi-gun, Osaka, Japan		
GIVEN NAME/FAMILY NAME Kanshi SAKAI	INVENTOR'S SIGNATURE <i>Kanshi Sakai</i>	DATE* APR 10, 2000
Residence (City, State & Country) Toyota-shi, Aichi, Japan		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan		
GIVEN NAME/FAMILY NAME Yasumitsu SUZUKI	INVENTOR'S SIGNATURE <i>Yasumitsu Suzuki</i>	DATE* APR 10, 2000
Residence (City, State & Country) Toyota-shi, Aichi, Japan		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan		
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\*DATE OF SIGNATURE

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Inventor, if any: see  
above

Full Name of Seventh  
Inventor, if any: see  
above

Full Name of Eighth  
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Full Name of Eleventh  
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above

Full Name of Twelfth  
Inventor, if any: see  
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GIVEN NAME/FAMILY NAME Masato FUJIOKA		INVENTOR'S SIGNATURE	DATE*
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Kyuchiku Kogyo KK, 9-10, Sanno 1-chome, Yahatahigashi-ku, Kitakyushu-shi, Fukuoka, Japan			
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GIVEN NAME/FAMILY NAME		INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			

\*DATE OF SIGNATURE

## BIRCH, STEWART, KOLASCH &amp; BIRCH, LLP

P.O. Box 747 • Falls Church, Virginia 22040-0747

Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

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Andrew D. Meikle	(Reg. No. 32,868)	Marc S. Weiner	(Reg. No. 32,181)
Joe McKinney Muncy	(Reg. No. 32,334)	Donald J. Daley	(Reg. No. 34,313)
John W. Bailey	(Reg. No. 32,881)	John A. Castellano	(Reg. No. 35,094)
Gary D. Yacura	(Reg. No. 35,416)		

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NOTE:  
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THE  
FOLLOWING:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First  
or Sole Inventor:  
Insert Name of  
Inventor  
Insert Date This  
Document is  
Signed

Insert Residence  
Insert Citizenship  
Insert Post Office  
Address

Full Name of Second  
Inventor, if any:  
see  
above

Full Name of Third  
Inventor, if any:  
see  
above

Full Name of Fourth  
Inventor, if any:  
see  
above

Full Name of Fifth  
Inventor, if any:  
see  
above

GIVEN NAME/FAMILY NAME Mitsuhiko FUKABORI		INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Hyogo, Japan		CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 90-38, Shinzaikai, Ibogawa-cho, Ibo-gun, Hyogo, Japan			
GIVEN NAME/FAMILY NAME Nobuo NAKABAYASHI		INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Osaka, Japan		CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 153, Moriya, Chihaya-Akasakamura, Minamikawachi-gun, Osaka, Japan			
GIVEN NAME/FAMILY NAME Kanshi SAKAI		INVENTOR'S SIGNATURE	DATE*
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan			
GIVEN NAME/FAMILY NAME Yasumitsu SUZUKI		INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Toyota-shi, Aichi, Japan		CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan			
GIVEN NAME/FAMILY NAME Norio YOSHITAKE		INVENTOR'S SIGNATURE <i>Norio Yoshitake</i>	DATE* APR 4, 2000
Residence (City, State & Country) Kitakyushu City, Fukuoka, Japan		CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Nippon Steel Corporation 46-59, Oaza-Nakabaru, Tobata-ku, Kitakyushu City, Fukuoka, Japan			

\*DATE OF SIGNATURE

Full Name of Sixth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME Masato FUJIOKA	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Kitakyushu-shi, Fukuoka, Japan	CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Kyuchiku Kogyo KK, 9-10, Sanno 1-chome, Yahatahigashi-ku, Kitakyushu-shi, Fukuoka, Japan		

Full Name of Seventh  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)	CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Eighth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)	CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Ninth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)	CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Tenth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)	CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Eleventh  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)	CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Twelfth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)	CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

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**BIRCH, STEWART, KOLASCH & BIRCH, LLP**P.O. Box 747 • Falls Church, Virginia 22040-0747  
Telephone: (703) 205-8000 • Facsimile: (703) 205-8050**PLEASE NOTE:  
YOU MUST  
COMPLETE THE  
FOLLOWING****COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR PATENT AND DESIGN APPLICATIONS**

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert Title:

INFLATOR PROCESSING APPARATUS AND METHOD OF JUDGING CHARGE OF INFLATORFill in Appropriate  
Information -  
For Use Without  
Specification  
Attached:

the specification of which is attached hereto. If not attached hereto,  
the specification was filed on \_\_\_\_\_ as  
United States Application Number \_\_\_\_\_;  
and amended on \_\_\_\_\_ (if applicable) and/or  
the specification was filed on September 29, 1997 as PCT  
International Application Number PCT/JP98/04366; and was  
amended under PCT Article 19 on \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## Prior Foreign Application(s)

## Priority Claimed

Insert Priority  
Information:  
(if appropriate)

<u>9/264574</u> (Number)	<u>Japan</u> (Country)	<u>September 29, 1997</u> (Month/Day/Year Filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Number)	_____ (Country)	_____ (Month/Day/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Number)	_____ (Country)	_____ (Month/Day/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Number)	_____ (Country)	_____ (Month/Day/Year Filed)	<input type="checkbox"/> Yes	<input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional applications(s) listed below.

Insert Provisional  
Application(s):  
(if any)

_____ (Application Number)	_____ (Filing Date)
_____ (Application Number)	_____ (Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

Country	Application Number	Date of Filing (Month/Day/Year)
---------	--------------------	---------------------------------

Insert Requested  
Information:  
(if appropriate)

_____	_____	_____
_____	_____	_____

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Insert Prior U.S.  
Application(s):  
(if any)

_____ (Application Number)	_____ (Filing Date)	_____ (Status - patented, pending, abandoned)
_____ (Application Number)	_____ (Filing Date)	_____ (Status - patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

Raymond C. Stewart	(Reg. No. 21,066)	Terrell C. Birch	(Reg. No. 19,382)
Joseph A. Kolasch	(Reg. No. 22,463)	James M. Slattery	(Reg. No. 28,380)
Bernard L. Sweeney	(Reg. No. 24,448)	Michael K. Mutter	(Reg. No. 29,680)
Charles Gorenstein	(Reg. No. 29,271)	Gerald M. Murphy, Jr.	(Reg. No. 28,977)
Leonard R. Svensson	(Reg. No. 30,330)	Terry L. Clark	(Reg. No. 32,644)
Andrew D. Meikle	(Reg. No. 32,868)	Marc S. Weiner	(Reg. No. 32,181)
Joe McKinney Muncy	(Reg. No. 32,334)	Donald J. Daley	(Reg. No. 34,313)
John W. Bailey	(Reg. No. 32,881)	John A. Castellano	(Reg. No. 35,094)
Gary D. Yacura	(Reg. No. 35,416)		

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Full Name of First  
or Sole Inventor:  
Insert Name of  
Inventor

Insert Date This  
Document is  
Signed

Insert Residence  
Insert Citizenship

Insert Post Office  
Address

Full Name of Second  
Inventor, if any:  
see  
above

Full Name of Third  
Inventor, if any:  
see  
above

Full Name of Fourth  
Inventor, if any:  
see  
above

Full Name of Fifth  
Inventor, if any:  
see  
above

GIVEN NAME/FAMILY NAME Mitsuhiko FUKABORI	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Hyogo, Japan	CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 90-38, Shinzaike, Ibogawa-cho, Ibo-gun, Hyogo, Japan		
GIVEN NAME/FAMILY NAME Nobuo NAKABAYASHI	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Osaka, Japan	CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) 153, Moriya, Chihaya-Akasakamura, Minamikawachi-gun, Osaka, Japan		
GIVEN NAME/FAMILY NAME Kanshi SAKAI	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Toyota-shi, Aichi, Japan	CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan		
GIVEN NAME/FAMILY NAME Yasumitsu SUZUKI	INVENTOR'S SIGNATURE	DATE*
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POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Toyota Jidosha Kabushiki Kaisha, 1, Toyotacho, Toyota-shi, Aichi, Japan		
GIVEN NAME/FAMILY NAME Norio YOSHITAKE	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country) Kitakyushu City, Fukuoka, Japan	CITIZENSHIP Japanese	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Nippon Steel Corporation 46-59, Oaza-Nakabaru, Tobata-ku, Kitakyushu City, Fukuoka, Japan		

Full Name of Sixth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME Masato FUJIOKA	INVENTOR'S SIGNATURE <i>Masato Fujioka</i>	DATE* MAR 29, 2000
Residence (City, State & Country) Kitakyushu-shi, Fukuoka, Japan		CITIZENSHIP Japanese
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) c/o Kyuchiku Kogyo KK, 9-10, Sanno 1-chome, Yahatahigashi-ku, Kitakyushu-shi, Fukuoka, Japan		

Full Name of Seventh  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Eighth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Ninth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Tenth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Eleventh  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		

Full Name of Twelfth  
Inventor, if any: see  
above

GIVEN NAME/FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)		